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Phytochemical Investigations of Some Green Leafy Vegetables for Pharmacological Importance

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ABSTRACT
The current investigation deals with the extraction and phytochemical characterization of *Trigonella foenum-graecum* and *Anethum graveolens*. The nutritional and medicinal benefits of vegetables provide a better support for human wellbeing. There are several vegetables which are used for day to day kitchen in different forms. In the present work, we have investigated phytochemicals of *Trigonella foenum-graecum* and *Anethum graveolens* which are one of the most important vegetables used in India. The presence of phytochemicals including phytosterols, saponins, alkaloids, phenolic compounds, tannins, proteins, glycosides, flavonoids, carbohydrates, quinones, coumerin, terpenoids, anthocyanins and emodins were determined for their presence. Phytosterols, proteins, glycosides, flavonoids, quinines, coumerin and terpenoids were present in both of the vegetables while alkaloid is present only in *Trigonella foenum-graecum*. Saponines, phenolic compounds and tannins, anthocyanins and emodins were absent in both vegetables. It was concluded that the extracts of both vegetables consists of important constituents of pharmacological activities.

Keywords*:* Vegetables, Extraction, Phytochemicals, *Trigonella foenum-graecum*, *Anethum graveolens*.

INTRODUCTION

The universe is full of vast varities consisting underutilized species of fruits, vegetables and many other plants found in localized regions which are consumed by rural peoples. Fruits, vegetables, herbs and spices contains various biological compounds known as phytochemicals[1] which have been linked to reduced the risk of major degenerative diseases[2]. They are also known as plant derived chemicals useful to human health and disease prevention[3]. Vegetables contain vitamins and pro-vitamins and compounds which plays a crucial role in the prevention of chronic disease like cancer, cardiovascular disease, diabetes[4].

Many plants have been used in folk medicine to treat various infections because of the presence of bioactive substances such as alkaloids, flavonoids, phenolic compounds and tannins[5]. Some researchers reported that, the dark green leafy vegetables contains carotenoid such as lutein and zeaxanthin. They protect the eyes from cataract and age related muscular degeneration as they deposit in the eye lense and muscular region of the retina.

Green leafy vegetables are good source of minerals and vitamins. They are also rich in antioxidants with various phytochemicals such as vitamin C, flavonoids and carotenoids. Chlorophyll is proven to help in decreasing the risk of heart diseases, stroke, several cancers and also helps in production of red blood cells[6].

Now a day's world markets are turning towards secondary metabolites derived from plants which are an important source of various phytochemicals used directly or as an intermediate for production of pharmaceuticals[7,8]. In various foods as a supplement and also in the form of preservatives. In the developing countries, about 80% of population depends on the traditional medicine derived from plants[9-11]. As these synthetic drugs have side effects, day by day the demand for herbal medicines is continuously increasing.

Different fruits and vegetables contains various important phytochemicals which have potential to fight against various human diseases. Some of these include high blood pressure, heart attacks, diabetics etc.

Most of the vegetables and fruits were mainly consumed for their nutritional values without much considering their medicinal importance and very few species have been explored for chemicals and biological studies[12].

Some studies had been conducted on chemical composition of leafy vegetables which showed that, they contains enormous amounts of micronutrients and also possess compounds that are essential for their medicinal values and human well being. Some vegetables have potential to cure more than one illness. These medicinal values of vegetables are due to the presence of phytochemicals and other chemical constituents[13].

MATERIALS AND METHODS

Plant material collection

The plant material *Trigonella foenum-graecum* and *Anethum graveolens* were collected from Northern Western Ghats of India. The plant material was collected in plastic zip lock bags and brought to the laboratory, washed thrice with tap water to remove any debris and then washed by double distilled water. The cleaned material was shed dried and used for the extraction.

Preparation of plant extracts

Dried plant samples were crushed to powder form and an aliquot of 5 gm of powdered plant sample was soaked in extraction solution, chloroform: acetone (1: 1). The whole mixture of plant powder and extraction solution was incubated at 4°C for 48 hrs. After incubation period the mixture was filtered and centrifuged at 10,000 rpm at 4°C. The extracts were concentrated to dryness in rotary evaporator (IKA, RV 10 Control) and were stored at 4°C until further use.

Phytochemicals analysis

Phytochemical analysis of the test sample was carried out according to standard methods[14-19].

RESULTS AND DISCUSSION

The extracts obtained were dried, weighed and percentage yield was calculated as depicted in the Table 1.

Plants	Part used for extraction	Percentage yield of extracts
Trigonella foenum-graecum	leaves	0.45 ± 0.036
Anethum graveolens	leaves	0.32 ± 0.04

Table 1. Percentage yield of extract.
Values are means of three readings ± SE

Sr. No.	Parameters	*Trigonella foenum-graecum*
1	Phytosterols	+
2	Saponnins	-
3	Alkaloids	+
4	Phenolic compound and Tannins	-
5	Proteins	+
6	Glycosides	+
7	Flavanoids	+
8	Carbohydrates (by Fehling's)	-
9	Carbohydrates (by Benedict's)	+
10	Quinones	+
11	Coumerin	+
12	Terpenoids	+
13	Anthocyanins	-
14	Emodins	-

Table 2. Phytochemical analysis of *Trigonella foenum-graecum*.

Sr. No.	Parameters	*Anethum graveolens*
1	Phytosterols	+
2	Saponnins	-
3	Alkaloids	-
4	Phenolic compound and Tannins	-
5	Proteins	+
6	Glycosides	+
7	Flavonoids	+
8	Carbohydrates (by Fehling's)	+
9	Carbohydrates (by Benedict's)	-
10	Quinones	+
11	Coumerin	+
12	Terpenoids	+
13	Anthocyanins	-
14	Emodins	-

Table 3 Phytochemical analysis of *Anethum graveolens*.

The result of phytochemical analysis of the green leafy vegetables is presented in table 2 and 3. The result reveals that most of the phytochemicals analyzed were present in both of the vegetables. Phytosterols, proteins, glycosides, flavonoids, quinines, coumerin and terpenoids were present in both of the vegetables while alkaloid is present only in *Trigonella foenum-graecum* (methi). Saponines, phenolic compounds and tannins, anthocyanins and emodins were absent in both vegetables.

The green leafy vegetables were collected from Northern Western Ghats which is a part of ecologically important ranges of Western Ghats, includes number of endemic species of flora and fauna. The Western Ghats are a mountain range that runs almost parallel to the Western coast of the Indian peninsula, located entirely in India. It is a UNESCO World Heritage Site and is one of the twenty five "mega biodiversity" hotspots in the world [20, 21].

Phytosterols are present in both vegetables. Steroids and sterols are of great importance in pharmacy due to its relationship with compounds like, sex hormones and can be used for drug production[22]. Saponin was richly distributed in the vegetables. In the present study saponin is absent in both the vegetables. Phenolic compounds and tannins also absent in both the vegetable extracts. The extracts of *Trigonella foenum-graecum* and *Anethum graveolens* exhibits the presence of proteins and carbohydrates. In addition to phytochemicals, some researchers stated that green leafy vegetables have nutritive and medicinal value as it contains more protein, minerals, carbohydrates and other important phytochemicals [23].

Glycosides are present in both vegetables which have been used since many centuries as stimulants in treatment of cardiac failure and cardiac diseases[24].

Phytochemicals are present in varying amounts in leafy vegetables. The amount of phytochemicals in

plant varies depending on species and varieties of green leafy vegetables.

Since past few years, phenolic content in plants have gain importance due to its high anti-oxidant, anti-inflammatory and anti-carcinogenic activity. It also plays important role in decreasing the risk of many human disease[25, 26].

The ingestion of phytochemicals found in food materials is important for the well being of peoples. The medicinal plant contains several phytochemicals with pharmacological and physiological activities. Unlike medicinal plants, green leafy vegetables are important in the proportion of food with medicinal value. Very little information is available on the medicinal properties associated with green leafy vegetables consumed in the state of Maharashtra. Green leafy vegetables acts as good source of natural anti-oxidants which are responsible for maintaining good health and protect against various diseases including heart diseases and cancer.

Work had been done on the analysis of chemical constituents from green leafy vegetables like *Allmaniano diflora*, *Amaranthus caudatus*, *Basella rubra*, *Boerhavia diffusa*, *Hibiscus cannabinus*. It is reported to have phytochemicals like alkaloids, glycosides, flavonoids, saponins, tannins, steroids, carbohydrates, caotenoids, anthocyanins, essential oil and amino acids[27-31].

Green leafy vegetables are comparatively costing low but are rich source of many micronutrients and phytochemicals. Green leafy vegetables are preferred not only because of the presence of protective nutrients and monotonous diet but also have alternative test pleasing appearance and aroma[32].

CONCLUSION

The commonly consumed green leafy vegetables in India selected for the present study contains substantial amount of phytochemicals, which are helpful in the prevention of some deadly diseases. The phytochemicals were not affected by cooking except for flavonoids and alkaloids, overruling the fear of losing these plant chemicals as a result of cooking. Vitamins and minerals can be lost (leached out) during cooking. This work also showed that the *Trigonella foenum-graecum* and *Anethum graveolens* are one of the most cherished vegetables in India which is very rich in most of the phytochemicals.

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